PCT/GB04/02361

INVESTOR IN PEOPLE

PRIORITY DOCUMENT

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I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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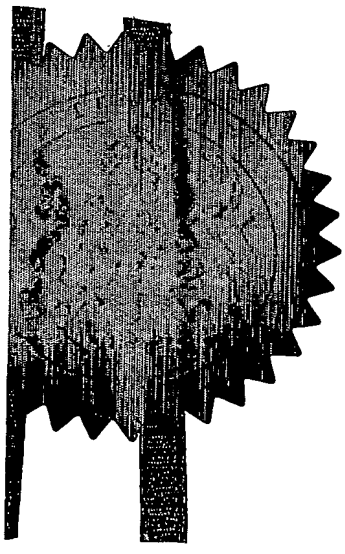

Signed

Dated 16 July 2004

230EC03 E861719-1 D02761
P01/7700 0.00-0329808.0 NONE

Patents Form 1/77

Patents Act 1977
(Rule 16)

1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get and explanatory leaflet from the Patent Office to help you fill in this form)

2 3 DEC 2003

The Patent Office

Cardiff Road
NEWPORT
South Wales
NP10 8QQ

1. Your reference

P1187.GBA

2. Patent application number

0329808.0

(The Patent Office will fill in this part)

3. Full name, address and postcode of the or of each applicant. *(underline all surnames)*

Newlands Technology Limited
Unit 3F Newlands Science Park
Inglemire Lane
HULL
HU6 7TQ

Patents ADP number *(if you know it)*

07857451002

If the applicant is a corporate body, give the country/state of its incorporation

UK

4. Title of the invention

NOISE POLLUTION LIMITER

5. Name of your agent *(if you have one)*

LOVEN & CO

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Quantum House
30 Tentercroft Street
LINCOLN
LN5 7DB

Patents ADP number *(if you know it)*

4467460003

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)

Number of earlier UK application	Date of filing *(day / month / year)*

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Answer YES if:
(a) any applicant named in part 3 is not an inventor, or
(b) there is an inventor who is not named as an applicant, or
(c) any named applicant is a corporate body.
Otherwise answer NO (See note (d))

P nts Form 1/77

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form 0

Description 5

Claim(s) 0

Abstract 0

Drawing(s) 0

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature(s)

Date 23 December 2003

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

K J Loven ((0)1522 801113) (keith.loven@loven.co.uk)

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) If you need help to fill in this form or have any questions, please contact the Patent Office on 08459 500505

b) Write your answers in capital letters using black ink or you may type them.

c) If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.

d) If you have answered YES in Part 8, a Patents Form 7/77 will need to be filed.

e) Once you have filled in this form you must remember to sign and date it.

f) Part 7 should only be completed when a divisional application is being made under section 15(4), or when an application is being made under section 8(3), 12(6) or 37(4) following an entitlement dispute. By completing part 7 you are requesting that this application takes the same filing date as an earlier UK application. If you want the new application to have the same priority date(s) as the earlier UK application, you should also complete part 6 with the priority details.

Noise Pollution Limiter

Field of the Invention

This invention relates to the control of noise levels to avoid environmental noise pollution or to create areas of sound masking.

Background to the Invention

In the use of loudspeakers or panel acoustic emitters to provide information in public spaces it is usual that the sound emitted from the panel or loudspeaker is at a constant volume, or may be turned up and down manually in response to complaints or requests. This is inconvenient and results usually from variations in the ambient noise level so that the emitted sound will at different times appear either too loud or not loud enough. If a loudspeaker is used as the emitter the point source nature of this emitter means that the sound is often projected beyond the area in which it is required and creates a noise nuisance.

It is well known that automatic gain control (AGC) circuits have been used in cars to increase the volume from the radio as the car goes faster and the ambient noise level increases. It is also known that signal compression has been used to reduce the dynamic range of radio output in car radios so that the quiet pieces of music can still be heard above high ambient noise levels, without making the louder pieces in the music too loud. Both of these mechanisms are designed to avoid the driver having to constantly adjust the volume controls.

Our PCT application PCT/GB02/01111 describes an application for the use of actuators, and more particularly magnetostrictive actuators, to drive panels to be used as advertising or information media, for example kiosks in shops, the shop window itself, or train and bus panels and windows. Panels driven in this way produce, in effect, a multiplicity of small point sources which behave as a flat pane sound source.

Summary of the Invention

This invention provides means for varying the emitted sound level so that it remains at a constant average level above ambient, in order to enable shaping of the emitted sound envelope so that it stays within the area in which it is needed and avoids unnecessary noise pollution. It can also be used to create a controlled envelope or curtain of

white or pink noise or a specialised mix of frequencies that directly affect the incoming audio signal, for example speech, so that private conversations are masked and cannot be overheard or zones where external noise is damped or masked to create apparent 'quiet' areas or areas where there is a perception of quiet. This perception of quiet is a function of the psycho-acoustic effect of the source of the issued signal being closer to the recipient than the background noise sources, a phenomenon that has been widely reported, achieved by the sound envelope created by the large planar signal creating a volume of sound, rather than a point source of sound normally achieved by traditional point source speaker solutions.

According to this invention it has been found that using AGC circuitry and compression of the output audio signal together with a panel based sound emitter, a planar sound envelope can be created that generally follows the contours of the panel which can be so configured to avoid the sound emitted from the panel, shop window or kiosk from spilling into areas where it is not needed. This is achieved by the planar signal being carefully set to a fixed volume above the ambient such that the emitted signal appears to travel a controlled distance before being confronted and overpowered by the ambient sound.

It has been found that point source emitters, loudspeakers, cannot usefully be controlled in this way. It is well known that that sound needs to be only a small number of decibels above the ambient noise level to be noticed (at the lower end of the range) and to be heard and understood (at the upper end of the range).

According to this invention any given site that has external levels of sound of the type generated by passing cars, people etc, can be calibrated so that at a given distance from the emitter (for example a window) the sound which is output at a small number of decibels higher than the ambient sound (3dB – 10dB depending on ambient conditions) falls below the ambient at a predictable distance due to the strength of the ambient noise in the area, and it is no longer heard because it is masked or overpowered by the ambient noise. If panel emitters are used, for example by converting a shop window into a planar loudspeaker, then the edge of the sound envelope so created will be perceived to run generally parallel to the shop window and can be tailored to be heard for only a fixed dis-

tance from the window, perhaps the width of the pavement. The planar signal, the control system and the preset values programmed into the automatic gain control system are all key elements in establishing this level of control. There are a number of proprietary gain control systems that are available on the market, for example the Symetrix 371 or 372. However, traditionally they are not used in conjunction with large planar emitting panels for the purposes referred to herein.

In a train carriage the same effect can be used to deliver information only to certain areas or to control sound masking outputs so that the conversations in one seating area cannot be overheard in another. In this application of the invention, the driven surfaces may be dividers, tables, windows, luggage racks or seat backs, for example.

The system of this invention may also be used to shape sound to guide people along certain street areas or in certain directions for crowd control. For example in tunnels, a ceiling mounted system could be used that enables people to hear their way through the tunnel in the event of fire. In retail or other public places where the system is used for advertising, the gain control will ensure that the public below the surface hear the audio signal as they move through the space or stand beneath it, in a similar fashion to that described above.

Periodic sampling of the ambient noise level is needed with feedback through digital or analogue AGC circuitry to maintain the correct size of the sound envelope, i.e. the distance from the emitter that the sound can be heard at a higher level than the background. The sampling is preferably arranged to take place in the absence of the emitted sound, and is averaged over a suitable period to avoid unnecessarily rapid changes in emitted sound volume.

In one embodiment of the invention, the AGC circuitry is configured to detect small gaps or pauses, for example in the speech or music, in the input signal from the audio source and to measure the ambient noise level during these gaps or pauses. In an alternative embodiment, the sampling is taken simultaneously when the output is running and deducted from the known level of output determined by the system. In either embodiment, the microphone signal is averaged over time and used to alter the volume of the output so that the output volume is maintained at a predetermined level above ambi-

ent. The rate of increase and decrease is an important part of this consideration. For example, it is necessary that the decrease is faster than the increase such that, as the ambient sound level drops, the emitted sound does not lag at the higher level and create a nuisance. Compression of the dynamic range of the output signal further improves the definition of the boundaries of the sound envelope and makes it easier to maintain a constant boundary distance from the emitter. In this instance, a compressor limiter would be used in conjunction with the control system allowing a simpler set up to be achieved by determining only the level of gain over the ambient noise required and the actual volume to set the system in the first instance.

In either case, however, in order to provide a control interface after the system has been calibrated, a volume differential control will be used, marked out in units that could correspond to distance from the emitter, to control the position of the boundary, so enabling the user to affect the distance to be covered by the audio.

In a further refinement of this system passive infrared detectors may be used to detect the presence of people and switch on the emitted sound only when there is someone there. Other types of input device may be used to detect the presence of people, for example the microphone that is used to determine the ambient sound level. Other controls, for example timers, a remote switching on and off, and a remote audio source control system, may be used.

The system may be tailored so that only one specific type of sound is being looked for, for example the sound of an aircraft to trigger a window masking system, a train, car noise, tunnel noise (if used in train windows) a similar where the output that is played (rather than musical speech) is a predetermined set of frequencies known to mask the effect of the identified external noise. Another application is to identify an increase in ambient noise outside the door, all the noise in an adjoining room in for example the motor, which may be the trigger used to instigate a masking signal to be issued from the window, door wall panel. Many similar applications may be found for the invention.

A system could be configured to monitor the audible signal generated by a panel or other surface and thereby determined the integrity of the panel. One application of this aspect of the invention would be in any self-contained or open structure where the

integrity of the structure will respond to the input frequency in the known and predictable manner. When the emitted signal is sent, the microphone will pick up this output and compare it with a stored reference signal. Any change in the received response as compared with a stored reference signal can indicate that the structure has been damaged or its integrity otherwise affected, and so allow a warning to be issued.